

AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings include changes to Figs. 4(a)-(g) and 5(a)-(f). These sheets, which include Figs. 4(a)-(g) and 5(a)-(f), replace the original sheets including Figs. 4(a)-(g) and 5(a)-(f).

Attachment: Replacement Sheets (2)

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1, 3 and 7-9 are presently active in this case. The present Amendment amends Claim 1; cancels Claims 2 and 4-6 and adds new Claims 7-9.

In the outstanding Office Action, the Restriction Requirement was made final. The drawings were objected to because of an informality. Claims 1-3 were rejected under 35 U.S.C. § 103(a) as unpatentable over Murduck et al. (IEEE publication, herein referred as “Murduck”) or Applicant’s prior art admissions in view of Itozaki et al. (U.S. Patent No. 4,942,142, herein referred as “Itozaki”). Claims 1-3 were further rejected under 35 U.S.C. § 103(a) as unpatentable over Murduck or applicant’s prior art admissions in view of Itozaki and further in view of Ohara (U.S. Patent No. 5,068,694).

In response to the Restriction Requirement being made final, Claims 4-6, directed to non-elected inventions, are canceled. Applicants reserve the right to present claims directed to the non-elected inventions in a divisional application, which shall be subject to the third sentence of 35 U.S.C. § 121.¹

In response to the objection to the drawings, submitted herewith is a Letter Submitting Drawing Sheets along with 2 Replacement Sheets for Figs. 4(a)-(g) and 5(a)-(f) adding the appropriate “Prior Art” legends.

In order to clarify Applicant's invention, Claim 1 is amended to recite an “Nb superconducting electrode” and that “said insulating layer being formed of a high-resolution, photosensitive, solvent-soluble *block-copolyimide*.” This amendment finds support non-limiting support at page 7, lines 16-18 and at page 7, lines 22-25.

¹ "A patent issuing on an application with respect to which a requirement for restriction under this section has been made ... shall not be used as a reference ... against a divisional application." See also MPEP 804.01.

To vary the scope of protection recited in the claims, new Claims 7-9 are added. New Claims 7-9 find non-limiting support in the disclosure as originally filed, for example at page 8, lines 14-18 and lines 25-28. Therefore, new Claims 7-9 are not believed to raise a question of new matter.²

In response to the rejections of Claims 1-3 under 35 U.S.C. §103(a), Applicants respectfully request reconsideration of these rejections and traverse the rejections, as discussed next.

Briefly recapitulating, Applicants' invention, as recited in Claim 1, relates to a superconducting integrated circuit including a multilayer structure formed on a substrate and composed of a lower Nb superconducting electrode, a tunnel barrier and an upper Nb superconducting electrode, sequentially joined together upward in that order. The circuit also includes an insulating layer formed of a high-resolution, photosensitive, solvent-soluble block-copolyimide.

The properties of conventional multilayer structures deteriorate when heated to a temperature of higher than 150°C.³ However, when using block-copolyimide, as recited in amended Claim 1, the temperature for the heat-treatment for vaporizing the solvent and photosensitive material can be kept in a range of 120°C to 150°C,⁴ as recited in new Claim 7. Therefore, the high-grade features of the superconducting tunnel junction device, according to Applicants' invention, can be retained.

Turning now to the applied prior art, Murduck discloses a series of experiments to compare junction electrical performance in a Josephson junction fabrication process.

Murduck further discloses a device with a superconducting ground plane, a barrier electrode,

² See MPEP 2163.06 stating that "information contained in any one of the specification, claims or drawings of the application as filed may be added to any other part of the application without introducing new matter."

³ See Applicants' specification at page 2, paragraph [0008], lines 24-25.

⁴ See Applicants' specification at page 8, paragraph [0039], lines 15-18.

and the barrier and counter electrode of a SNS-type junction process.⁵ The Murduck publication, however, fails to teach or suggest Applicants' claimed *insulating layer* formed of a high-resolution, photosensitive *block-copolyimide*.

The outstanding Office Action rejects Applicants' Claims 1-3 based on the proposition that Itozaki discloses a "polyimide insulation protection,"⁶ and that it would have been obvious to modify the Murduck device by importing this feature from Itozaki to arrive at Applicants' claimed invention. Applicants respectfully submit, however, that Itozaki fails to disclose the claimed *insulating layer* formed of block-copolyimide, as next discussed.

The outstanding Office Action relies on the Itozaki patent's text at column 3, lines 15-25. This passage of Itozaki discloses that a substrate is covered with a *protective* film layer, which is composed of polymer compounds. The Itozaki patent further states at column 3, lines 8-14, that "the polymer compound is selected from a group comprising silicon resins, epoxy resins and polyimide resin which are used as a passivation layer in the field of LSI." Reading Itozaki, a person of ordinary skill in the art would understand that Itozaki's *protective* film layer composed of polymer compounds *is not* an insulating layer formed of block-copolyimide.

The outstanding Office Action appears to regard a "protective film layer" and an "insulation layer" as being identical features. Applicants respectfully disagree because these layers have different functions. A protection layer is not necessary an insulation layer. The Murduck and Itozaki references do not teach or suggest anything regarding "insulation protection" as suggested by the outstanding Office Action, nor an "insulation layer," as recited in Applicants' claims. Therefore, even if the combination of the Murduck publication and the Itozaki patent is assumed to be proper, the combination fails to teach every element

⁵ See Murduck in the Abstract and in Fig. 1.

⁶ See outstanding Office Action at page 2, line 24 to page 3, line 3.

of the claimed invention. Specifically, the combination fails to teach the claimed insulating layer formed of block-copolyimide.

Additionally, Applicants respectfully traverse the obviousness rejection based on the Murduck publication and the Itozaki patent because there is insufficient evidence for a motivation to modify Murduck's Josephson junction fabrication process by incorporating Itozaki's polymer compound, for the following reasons.⁷

The outstanding Office Action states that the proposed modification would have been obvious to obtain the advantages of Itozaki's protection layer, including low temperature processing and chemical stability.⁸ The record, however, fails to provide the required evidence of a motivation for a person of ordinary skill in the art to perform such modification. While Itozaki may provide a reason for using polyimide compound as a passivation layer prepared by a conventional coating technique,⁹ Itozaki fails to suggest why a person of ordinary skill in the art would be motivated to incorporate such a feature in a Josephson junction fabrication process such as the one disclosed in the Murduck publication. In particular, Itozaki uses a passivation layer or protective layer in order to suppress liberation of oxygen from the crystalline superconducting thin film.¹⁰ The application of Itozaki's protection layer cured at 300°C to Murduck's Josephson junction fabrication process cannot clear the contact perforation by using the lithography technique. In addition, Itozaki also teaches that a surface of the superconducting thin film is coated with polyimide by spin-coating technique and cured at 300°C.¹¹ Itozaki, however, does not suggest that a

⁷ See MPEP 2143.01 stating "[o]bviousness can only be established by combining or modifying the teaching of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art," (citations omitted). See also MPEP 2144.08 III stating that "[e]xplicit findings on motivation or suggestion to select the claimed invention should also be articulated in order to support a 35 U.S.C. 103 ground of rejection. . . . Conclusory statements of similarity or motivation, without any articulated rational or evidentiary support, do not constitute sufficient factual findings."

⁸ See outstanding Office Action at page 3, lines 1-3.

⁹ See Itozaki at column 3, lines 8-11 and lines 26-29.

¹⁰ See Itozaki at column 3, lines 15-20.

¹¹ See Itozaki at column 6, lines 52-55.

protection layer cured at 300°C would work in a Josephson junction fabrication process of Murduck. Thermal post-treatments above 150°C can deteriorate the high-grade features of Murduck's superconducting tunnel junction device, and therefore Itozaki teaches away from Murduck's goal of improving the junction performance.

Furthermore, Murduck is not concerned with suppressing the liberation of oxygen from the crystalline superconducting thin-film. Instead, Murduck is concerned with critical fabrication process factors related to the junction electrical performance.¹² Murduck states that its structure already achieves the goal of reduced junction excess current.¹³ Murduck does not suggest that further improvement is desired, nor that another feature should be added to further improve the junction characteristics. In particular, Murduck does not suggest to add a protection layer cured at 300°C, such as those disclosed in the Itozaki patent.

Murduck and Itozaki, therefore, do not provide the motivation to perform the proposed modification of the Murduck device. In other words, an attempt to bring in the isolated teaching of Itozaki's protective layer into Murduck's Josephson junction fabrication process device would amount to improperly picking and choosing features from different references without regard to the teachings of the references as a whole.¹⁴ While the required evidence of motivation to combine need not come from the applied references themselves, the evidence must come from *somewhere* within the record.¹⁵ In this case, the record fails to support the proposed modification of the Murduck system.

¹² See in Murduck, for example, in the Abstract.

¹³ See in Murduck, for example, in the Abstract.

¹⁴ See In re Ehrreich 590 F.2d 902, 200 USPQ 504 (CCPA, 1979) (stating that patentability must be addressed "in terms of what would have been obvious to one of ordinary skill in the art at the time the invention was made in view of the sum of all the relevant teachings in the art, not in view of first one and then another of the isolated teachings in the art," and that one "must consider the entirety of the disclosure made by the references, and avoid combining them indiscriminately.")

¹⁵ In re Lee, 277 F.3d 1338, 1343-4, 61 USPQ2d 1430 (Fed. Cir. 2002) ("The factual inquiry whether to combine references ... must be based on objective evidence of record. ... [The] factual question of motivation ... cannot be resolved on subjective belief and unknown authority. ... Thus, the Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion").

Furthermore, Applicants respectfully submit that the Ohara reference does not overcome the above mentioned insufficiencies of Murduck and Itozaki. Accordingly, Applicants respectfully traverse, and request reconsideration of, the outstanding rejections based on these references.

In rejecting a claim under 35 U.S.C. § 103(a), the USPTO must support its rejection by "substantial evidence" within the record,¹⁶ and by "clear and particular" evidence¹⁷ of a suggestion, teaching, or motivation to combine the teachings of different references. As discussed above, there is no substantial evidence, nor clear and particular evidence, within the record of motivation for modifying Murduck by incorporating Itozaki's protective layer. Without such motivation and absent improper hindsight reconstruction,¹⁸ a person of ordinary skill in the art would not be motivated to perform the proposed modification, and Claims 1, 3 and 7-9 are believed to be non-obvious and patentable over the applied prior art.

Furthermore, new Claims 7-9 recite features that are not taught or suggested by the prior art, in combination with the features of Claim 1, even if the applied combination of prior art references is assumed to be proper. Accordingly, new Claims 7-9 are further patentably distinct over the prior art and allowable.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1, 3 and 7-9 is earnestly solicited.

¹⁶ In re Gartside, 203 F3d 1305, 53 USPQ2d 1769 (Fed. Cir. 2000) (holding that, consistent with the Administrative Procedure Act at 5 USC 706(e), the CAFC reviews the Board's decisions based on factfindings, such as 35 U.S.C. § 103(a) rejections, using the 'substantial evidence' standard because these decisions are confined to the factual record compiled by the Board.)

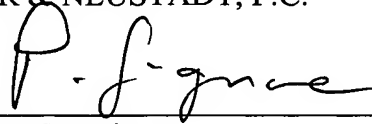
¹⁷ In re Dembiczak, 175 F3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999) ("We have noted that evidence of a suggestion, teaching, or motivation to combine may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved, although 'the suggestion more often comes from the teachings of the pertinent references.' The range of sources available, however, does not diminish the requirement for actual evidence. That is, the showing must be clear and particular.") (emphasis added).

¹⁸ See MPEP 2141, stating, as one of the tenets of patent law applying to 35 USC 103, that "[t]he references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention."

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicant's undersigned representative at the below listed telephone number.

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